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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/649,049

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Gisela Schammler

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EXAMINER

NGUYEN, DINH P

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/649,049

Applicant(s)

SCHAMMLER ET AL.

Examiner

DiLinh Nguyen

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) 23-29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11/28/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election of Group I, claims 1-22 in the reply filed on 4/27/04 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims 7-8. Therefore, a second solder bump formed over a second absorption layer, wherein the absorption layer and the second absorption layer are laterally isolated from each other by a spacing of approximately 1-100 micrometers must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The

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replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The specification fails to disclose a second solder bump formed over a second absorption layer, wherein the absorption layer and the second absorption layer are laterally isolated from each other by a spacing of approximately 1-100 micrometers.

Claim Objections

Claims 8 and 22 are objected to because of the following informalities:

Claim 8 can not depends on itself.

In line 1 of claim 22, replace "multiplayer" with --multilayer--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 7-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 7-8 recite "...a second solder bump formed over a second absorption layer, wherein the absorption layer and the second absorption layer are laterally isolated from each other by a spacing of approximately 1-100 micrometers..." is not understood.

Where are a second solder bump and second absorption layers; wherein the first and second absorption layers are laterally isolated from each other by a spacing of approximately 1-100 micrometers?

The specification and the drawings fail to disclose a second solder bump formed over a second absorption layer, wherein the absorption layer and the second absorption layer are laterally isolated from each other by a spacing of approximately 1-100 micrometers.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-6, 9-13, 16 and 18-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Elenius et al. (U.S. Pat. 6287893).

- Regarding claims 1-2, Elenius et al. disclose a semiconductor device comprising:
 - a substrate 14 including a contact pad 26;
 - a solder bump 28 formed on the contact pad (fig. 2, column 7, lines 8-30); and
 - an absorption layer 30 disposed between the contact pad and the solder bump,the absorption layer having a thickness that is configured [the layer 30 comprises

copper in a thickness of about two microns] (fig. 2, column 7, lines 10-22). Therefore, the absorption layer substantially stops alpha particles of at least 5.4 MeV.

- Regarding claim 3, Elenius et al. disclose that the absorption layer comprises two or more sub-layers (fig. 2, column 7, lines 14-17).
- Regarding claim 4, Elenius et al. disclose that the absorption layer 30 comprises copper in a thickness of about 2 microns (fig. 2, column 7, lines 14-22); therefore, the absorption layer is adapted to reduce passage of alpha particles to a rate less than 0.001 alpha particles/cm² an hour.
- Regarding claim 5, Elenius et al. disclose that the absorption layer 30 laterally extends beyond the solder bump 30 (fig. 2).
- Regarding claim 6, Elenius et al. disclose a passivation layer 33 covering a peripheral portion of the absorption layer (fig. 2, column 7, line 50).
- Regarding claim 9, Elenius et al. disclose that a thickness of the absorption layer 30 is in the range of approximately 1-10 micrometers (fig. 2, column 7, line 23).
- Regarding claim 10, Elenius et al. disclose that the absorption layer 30 comprises copper in a thickness of about 2 microns (fig. 2, column 7, lines 14-22); therefore, an intrinsic alpha particle emission rate of the absorption layer is less than 0.001 alpha particles/cm² an hour.
- Regarding claim 11, Elenius et al. disclose a semiconductor device comprising:
a substrate 14 including a contact pad 26;
a solder bump formed on the contact pad (fig. 2, column 7, lines 8-30; and

an underbump metallization 30 disposed between the contact pad and the solder bump, the underbump metallization substantially preventing diffusion of solder bump material into the substrate and providing adhesion of the solder bump to the substrate (fig. 2, column 7, lines 22-25), wherein the underbump metallization has a thickness sufficient [the layer 30 comprises copper in a thickness of about two microns] fig. 2, paragraph 0063, column 7, lines 14-22). Therefore, the underbump metallization stops alpha particles of approximately 5.4 MeV.

- Regarding claim 12, Elenius et al. disclose that the underbump metallization 30 comprises copper in a thickness of about 2 microns (fig. 2, column 7, lines 14-22); therefore, an intrinsic alpha particle emission rate of the underbump metallization is less than 0.001 alpha particles/cm² an hour.
- Regarding claim 13, Elenius et al. disclose that a thickness of the underbump metallization 30 is in the range of approximately 1-10 micrometers (fig. 2, column 7, lines 20-22).
- Regarding claim 16, Elenius et al. disclose that a lateral extension of the underbump metallization is larger than a lateral extension of the solder bump (cover fig.).
- Regarding claim 18, Elenius et al. disclose that a peripheral portion of the underbump metallization is coated with a passivation layer 33 (fig. 2, column 7, line 50).
- Regarding claim 19, Elenius et al. disclose a semiconductor device comprising: a substrate 14 including a functional element 10;

a solder bump 28 formed on a multilayer metal stack;

wherein the multilayer metal stack formed over the substrate, the multilayer metal stack comprises copper and nickel in a thickness of about 2 microns (fig. 2, column 7, lines 14-22). Therefore, the multilayer metal stack has an intrinsic alpha particle emission rate of less than 0.001 alpha particles/cm² an hour.

- Regarding claim 20, Elenius et al. disclose the multilayer metal stack laterally extends beyond the solder bump (fig. 2).
- Regarding claim 21, Elenius et al. disclose a passivation layer 33 covering a peripheral portion of the multilayer metal stack (fig. 2, column 7, line 50).
- Regarding claim 22, Elenius et al. disclose the multilayer metal stack comprises at least one of copper and nickel (fig. 2, column 7, lines 14-19).

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

3. Claims 1-5 and 9-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Chiu et al. (U.S. Pub. 2003/0119300).

- Regarding claims 1-2, Chiu et al. disclose a semiconductor device comprising:
 - a substrate 12 including a contact pad 15;
 - a solder bump 30 formed on the contact pad (cover fig., paragraph 0061); and
 - an absorption layer 26 disposed between the contact pad and the solder bump,the absorption layer having a thickness that is configured [the layer 26 comprises copper in a thickness of about five microns] (cover fig., paragraph 0063, lines 14-16). Therefore, the absorption layer substantially stops alpha particles of at least 5.4 MeV.

- Regarding claim 3, Chiu et al. disclose that the absorption layer comprises two or more sub-layers 28 or 20 (figs. 2B-2C, paragraph 0061-0063).
- Regarding claim 4, Chiu et al. disclose that the absorption layer 26 comprises copper in a thickness of about 5 microns (cover fig., paragraph 0063, lines 14-16); therefore, the absorption layer is adapted to reduce passage of alpha particles to a rate less than 0.001 alpha particles/cm² an hour.
- Regarding claim 5, Chiu et al. disclose that the absorption layer 26 laterally extends beyond the solder bump 30 (cover fig.).
- Regarding claim 9, Chiu et al. disclose that a thickness of the absorption layer 26 is in the range of approximately 1-10 micrometers (cover fig., paragraph 0063, lines 14-16).
- Regarding claim 10, Chiu et al. disclose that the absorption layer 26 comprises copper in a thickness of about 5 microns (cover fig., paragraph 0063, lines 14-16); therefore, an intrinsic alpha particle emission rate of the absorption layer is less than 0.001 alpha particles/cm² an hour.
- Regarding claim 11, Chiu et al. disclose a semiconductor device comprising:
 - a substrate 12 including a contact pad 15;
 - a solder bump formed on the contact pad; and
 - an underbump metallization 26 disposed between the contact pad and the solder bump, the underbump metallization substantially preventing diffusion of solder bump material into the substrate and providing adhesion of the solder bump to the substrate, wherein the underbump metallization has a thickness sufficient [the layer 26 comprises

copper in a thickness of about five microns] (cover fig., paragraph 0063, lines 14-16).

Therefore, the underbump metallization stops alpha particles of approximately 5.4 MeV.

- Regarding claim 12, Chiu et al. disclose that the underbump metallization 26 comprises copper in a thickness of about 5 microns (cover fig., paragraph 0063, lines 14-16); therefore, an intrinsic alpha particle emission rate of the underbump metallization is less than 0.001 alpha particles/cm² an hour.
- Regarding claim 13, Chiu et al. disclose that a thickness of the underbump metallization 26 is in the range of approximately 1-10 micrometers (cover fig., paragraph 0063, lines 14-16).
- Regarding claim 14, Chiu et al. disclose that the underbump metallization 26 comprises an absorption layer 28 having a thickness of approximately 3 micrometers (cover fig., paragraph 0063, lines 16-18).
- Regarding claim 15, Chiu et al. disclose that the absorption layer 28 comprises at least one of nickel (cover fig., paragraph 0063, lines 16-17).
- Regarding claim 16, Chiu et al. disclose that a lateral extension of the underbump metallization is larger than a lateral extension of the solder bump (cover fig.).
- Regarding claim 17, Chiu et al. disclose that a thickness of the absorption layer 28 is in the range of approximately 1-10 micrometers (cover fig., paragraph 0063, lines 16-18).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DiLinh Nguyen whose telephone number is (571) 272-1712. The examiner can normally be reached on 8:00AM - 6:00PM (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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